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EXAMINER	
ALIA, CURTIS A	

ART UNIT	PAPER NUMBER
2474	

NOTIFICATION DATE	DELIVERY MODE
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No.	Applicant(s)	
	10/781,951	WALTON ET AL.	
	Examiner	Art Unit	
	Curtis A. Alia	2474	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *15 December 2009*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-23 and 63* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-23 and 63* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

Applicant's amendment filed 15 December 2009 has been entered. Claims 1-23 and 63 are still pending in this application, with claims 1, 14, 19 and 63 being independent.

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Response to Arguments

1. Applicant's arguments filed 15 December 2009 have been fully considered but they are not persuasive.

In response to Applicant's argument that there is no teaching of randomizing effective SISO channels, the Examiner respectfully disagrees. In particular, Trikkonen teaches (at least in paragraphs 141-143) that a randomizing of transmit channels is occurring on the plurality of transmit antennas of the transmitter. This randomization of extra transmit capacity is equivalent to the randomizing of effective SISO channels (which is equivalent to the channels on the MIMO system of Trikkonen). Trikkonen aims to randomize the data channels so as to achieve transmit diversity across space and time.

In response to Applicant's argument that the combination does not teach obtaining for the data packet, a plurality of sequences of pilot and data symbols for the plurality of subbands, the

Examiner respectfully disagrees. In particular, Trikkonen teaches that pilot and data symbols are sent and received over a plurality of antennas on channels (see paragraphs 59-61). It is also taught that the pilot signals are used to aid in receiving each of the channels on the multiple antennas. Therefore, Trikkonen teaches the argued limitation.

In response to Applicant's argument that there is no teaching that spatial processing is performed "on at least one of the pilot and data symbols for each subband with at least one steering vector selected for the subband," the Examiner disagrees. The limitation can be interpreted as reciting that "spatial processing is performed on a pilot or data symbol for each subband with a steering vector selected for the subband." Onggosanusi teaches that "a plurality of non-interfering sub-channels can be defined. Transmission via the various sub-channels can be controlled through the appropriate selection of the values for a beamformer vector and the specific value for a frequency index" (see paragraph 41). Essentially, Onggosanusi is describing that a multi-antenna framework transmits data across multiple sub-channels (subbands) using selected beamformer vector values. In view of the above-recited disclosure of Onggosanusi and the reasonable interpretation of the claim limitation, it would have been understood by one of ordinary skill in the art at the time the invention was made to recognize that Onggosanusi teaches the argued limitation.

Double Patenting

2. A rejection based on double patenting of the "same invention" type finds its support in the language of 35 U.S.C. 101 which states that "whoever invents or discovers any new and useful process ... may obtain a patent therefor ..." (Emphasis added). Thus, the term "same invention," in this context, means an invention drawn to identical subject matter. See *Miller v.*

Eagle Mfg. Co., 151 U.S. 186 (1894); *In re Ockert*, 245 F.2d 467, 114 USPQ 330 (CCPA 1957); and *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970).

A statutory type (35 U.S.C. 101) double patenting rejection can be overcome by canceling or amending the conflicting claims so they are no longer coextensive in scope. The filing of a terminal disclaimer cannot overcome a double patenting rejection based upon 35 U.S.C. 101.

3. Claims 1-23 and 63 are provisionally rejected under 35 U.S.C. 101 as claiming the same invention as that of claims 1-8, 10-24 and 65 of copending Application No. 10/794,918. This is a provisional double patenting rejection since the conflicting claims have not in fact been patented.

Note: The amendment to the claims in co-pending Application No. 10/794,918, including the replacement of "data packet" with "protocol data unit (PDU)" does not overcome the provisional double patenting rejection under 35 U.S.C. 101. Protocol data units and packets are equivalent and do not render the claims of each application patentably distinct from one another.

Claim Rejections - 35 USC § 103

4. Claims 1-3, 5, 14-15, 19-20 and 63 are rejected under 35 U.S.C. 103(a) as being unpatentable over Trikkonen (previously cited US 2004/0002364) in view of Onggosanusi (previously cited US 2002/0114269).

Regarding claim 1, Trikkonen discloses a method of transmitting data from a transmitting entity to a receiving entity in a wireless multi-antenna communication system utilizing orthogonal frequency division multiplexing (OFDM), comprising processing a PDU to obtain a

block of data symbols (see paragraph 77, receiving data, processing data streams for transmission), demultiplexing pilot symbols and the block of data symbols onto a plurality of subbands to obtain, for the PDU, a plurality of sequences of pilot and data symbols for the plurality of subbands (see paragraphs 59-61, pilot signals are prepared for transmission, separated from the data stream, and multiple antennas are ready to transmit the data along separate bands) and performing spatial processing on at least one of the pilot and data symbols with at least one steering vector selected for the subband, the spatial processing randomizing a plurality of effective single-input single-output (SISO) channels observed across the plurality of subbands (see paragraphs 141-155, the channels are randomized, beamforming is used to steer the radio signal from the antennas (spatial processing), and sent across multiple antennas (plurality of effective SISO = MIMO)).

Trikkonen does not explicitly teach that the spatial processing is performed for each subband.

However, the above-mentioned claimed limitation is well known in the art, as evidenced by Onggosanusi. In particular, Onggosanusi teaches that the spatial processing is performed for each subband (see paragraphs 41-43, each subchannel is controlled through selection of values for a beamforming vector and frequency index, thus each subband is examined and controlled via beamforming (spatial processing)).

In view of the above, having the method of Trikkonen, then given the well-established teaching of Onggosanusi, it would have been obvious to a person having ordinary skill in the art at the time of the invention to modify the method of Trikkonen as taught by Onggosanusi, since

Onggosanusi stated that reducing the computational resources required for maintaining a spatially distinct beam-forming transmissions is possible.

Regarding claim 2, Trikkonen does not explicitly teach that the pilot and data symbols for each subband is spatially processed with one steering vector selected for the subband.

However, the above-mentioned claimed limitation is well known in the art, as evidenced by Onggosanusi. In particular, Onggosanusi teaches that the pilot and data symbols for each subband is spatially processed with one steering vector selected for the subband (see paragraphs 41-43, each subchannel is controlled through selection of values for a beamforming vector and frequency index, thus each subband is examined and controlled via beamforming (spatial processing), where each sub-channel is associated with a specific frequency index and beamformer weight).

In view of the above, having the method of Trikkonen, then given the well-established teaching of Onggosanusi, it would have been obvious to a person having ordinary skill in the art at the time of the invention to modify the method of Trikkonen as taught by Onggosanusi, since Onggosanusi stated that reducing the computational resources required for maintaining a spatially distinct beam-forming transmissions is possible.

Regarding claim 3, Trikkonen does not explicitly teach that a plurality of different steering vectors is used for the plurality of subbands.

However, the above-mentioned claimed limitation is well known in the art, as evidenced by Onggosanusi. In particular, Onggosanusi teaches that a plurality of different steering vectors

are used for the plurality of subbands (see paragraph 43, each sub-channel is associated with a specific frequency index and beamformer weight, thus a beamforming weight/vector is used for a particular subband).

In view of the above, having the method of Trikkonen, then given the well-established teaching of Onggosanusi, it would have been obvious to a person having ordinary skill in the art at the time of the invention to modify the method of Trikkonen as taught by Onggosanusi, since Onggosanusi stated that reducing the computational resources required for maintaining a spatially distinct beam-forming transmissions is possible.

Regarding claim 14, Trikkonen discloses an apparatus in a wireless multi-antenna communication system utilizing orthogonal frequency division multiplexing (OFDM), comprising a data processor operative to process a PDU to obtain a block of data symbols (see paragraph 77, receiving data, processing data streams for transmission), a demultiplexer operative to demultiplex pilot symbols and the block of data symbols onto a plurality of subbands to obtain, for the PDU, a plurality of sequences of pilot and data symbols for the plurality of subbands (see paragraphs 59-61, pilot signals are prepared for transmission, separated from the data stream, and multiple antennas are ready to transmit the data along separate bands) and a spatial processor operative to perform spatial processing on at least one of the pilot and data symbols with at least one steering vector selected for the subband, the spatial processing randomizing a plurality of effective single-input single-output (SISO) channels observed across the plurality of subbands (see paragraphs 141-155, the channels are randomized,

beamforming is used to steer the radio signal from the antennas (spatial processing), and sent across multiple antennas (plurality of effective SISO = MIMO)).

Trikkonen does not explicitly teach that the spatial processing is performed for each subband.

However, the above-mentioned claimed limitation is well known in the art, as evidenced by Onggosanusi. In particular, Onggosanusi teaches that the spatial processing is performed for each subband (see paragraphs 41-43, each subchannel is controlled through selection of values for a beamforming vector and frequency index, thus each subband is examined and controlled via beamforming (spatial processing)).

In view of the above, having the method of Trikkonen, then given the well-established teaching of Onggosanusi, it would have been obvious to a person having ordinary skill in the art at the time of the invention to modify the method of Trikkonen as taught by Onggosanusi, since Onggosanusi stated that reducing the computational resources required for maintaining a spatially distinct beam-forming transmissions is possible.

Regarding claim 15, Trikkonen does not explicitly teach that the spatial processor is operative to spatially process the pilot and data symbols for each subband with one steering vector selected for the subband.

However, the above-mentioned claimed limitation is well known in the art, as evidenced by Onggosanusi. In particular, Onggosanusi teaches that the spatial processor is operative to spatially process the pilot and data symbols for each subband with one steering vector selected for the subband (see paragraphs 41-43, each subchannel is controlled through selection of values

for a beamforming vector and frequency index, thus each subband is examined and controlled via beamforming (spatial processing), where each sub-channel is associated with a specific frequency index and beamformer weight).

In view of the above, having the method of Trikkonen, then given the well-established teaching of Onggosanusi, it would have been obvious to a person having ordinary skill in the art at the time of the invention to modify the method of Trikkonen as taught by Onggosanusi, since Onggosanusi stated that reducing the computational resources required for maintaining a spatially distinct beam-forming transmissions is possible.

Regarding claim 19, Trikkonen discloses an apparatus in a wireless multi-antenna communication system utilizing orthogonal frequency division multiplexing (OFDM), comprising means for processing a PDU to obtain a block of data symbols (see paragraph 77, receiving data, processing data streams for transmission), means for demultiplexing pilot symbols and the block of data symbols onto a plurality of subbands to obtain, for the PDU, a plurality of sequences of pilot and data symbols for the plurality of subbands (see paragraphs 59-61, pilot signals are prepared for transmission, separated from the data stream, and multiple antennas are ready to transmit the data along separate bands), and means for performing spatial processing on at least one of the pilot and data symbols with at least one steering vector selected for the subband, the spatial processing randomizing a plurality of effective single-input single-output (SISO) channels observed across the plurality of subbands (see paragraphs 141-155, the channels are randomized, beamforming is used to steer the radio signal from the antennas (spatial processing), and sent across multiple antennas (plurality of effective SISO = MIMO)).

Trikkonen does not explicitly teach that the spatial processing is performed for each subband.

However, the above-mentioned claimed limitation is well known in the art, as evidenced by Onggosanusi. In particular, Onggosanusi teaches that the spatial processing is performed for each subband (see paragraphs 41-43, each subchannel is controlled through selection of values for a beamforming vector and frequency index, thus each subband is examined and controlled via beamforming (spatial processing)).

In view of the above, having the method of Trikkonen, then given the well-established teaching of Onggosanusi, it would have been obvious to a person having ordinary skill in the art at the time of the invention to modify the method of Trikkonen as taught by Onggosanusi, since Onggosanusi stated that reducing the computational resources required for maintaining a spatially distinct beam-forming transmissions is possible.

Regarding claim 20, Trikkonen does not explicitly teach that the pilot and data symbols for each subband is spatially processed with one steering vector selected for the subband.

However, the above-mentioned claimed limitation is well known in the art, as evidenced by Onggosanusi. In particular, Onggosanusi teaches that the pilot and data symbols for each subband is spatially processed with one steering vector selected for the subband (see paragraph 43, each sub-channel is associated with a specific frequency index and beamformer weight, thus a beamforming weight/vector is used for a particular subband).

In view of the above, having the method of Trikkonen, then given the well-established teaching of Onggosanusi, it would have been obvious to a person having ordinary skill in the art

at the time of the invention to modify the method of Trikkonen as taught by Onggosanusi, since Onggosanusi stated that reducing the computational resources required for maintaining a spatially distinct beam-forming transmissions is possible.

Regarding claim 63, Trikkonen discloses a software storage apparatus for processing data for transmission from a transmitting entity to a receiving entity in a wireless multi-antenna communication system utilizing orthogonal frequency division multiplexing (OFDM) comprising a memory, the memory having instructions stored thereon, the instructions being executable by one or more processors (see paragraph 44, processors are present in the device which would be able to execute instructions) and the instructions comprising instructions for processing a PDU to obtain a block of data symbols (see paragraph 77, receiving data, processing data streams for transmission), instructions for demultiplexing pilot symbols and the block of data symbols onto a plurality of subbands to obtain, for the PDU, a plurality of sequences of pilot and data symbols for the plurality of subbands (see paragraphs 59-61, pilot signals are prepared for transmission, separated from the data stream, and multiple antennas are ready to transmit the data along separate bands), and instructions for performing spatial processing on at least one of the pilot and data symbols with at least one steering vector selected for the subband, the spatial processing randomizing a plurality of effective single-input single-output (SISO) channels observed across the plurality of subbands (see paragraphs 141-155, the channels are randomized, beamforming is used to steer the radio signal from the antennas (spatial processing), and sent across multiple antennas (plurality of effective SISO = MIMO)).

Trikkonen does not explicitly teach that the spatial processing is performed for each subband.

However, the above-mentioned claimed limitation is well known in the art, as evidenced by Ketchum. In particular, Ketchum teaches that the spatial processing is performed for each subband (see paragraphs 41-43, each subchannel is controlled through selection of values for a beamforming vector and frequency index, thus each subband is examined and controlled via beamforming (spatial processing)).

In view of the above, having the method of Trikkonen, then given the well-established teaching of Onggosanusi, it would have been obvious to a person having ordinary skill in the art at the time of the invention to modify the method of Trikkonen as taught by Onggosanusi, since Onggosanusi stated that reducing the computational resources required for maintaining a spatially distinct beam-forming transmissions is possible.

5. Claims 5, 16 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Trikkonen in view of Onggosanusi as applied to claims 1, 15 and 20 above, and further in view of Kim et al. (newly cited US 6,937,189).

Regarding claim 5, Trikkonen and Onggosanusi do not explicitly teach that the pilot and data symbols for each subband is spatially processed with at least two steering vectors selected for the subband.

However, the above-mentioned claimed limitation is well known in the art, as evidenced by Kim. In particular, Kim teaches that the pilot and data symbols for each subband is spatially

processed with at least two steering vectors selected for the subband (see column 2, lines 34+, beamforming algorithm is chosen based on whether the data is a pilot data symbol or a non pilot data symbol, thus a different steering vector is obtained on a pilot data symbol than a data symbol).

In view of the above, having the method of Trikkonen and Onggosanusi, then given the well-established teaching of Kim, it would have been obvious to a person having ordinary skill in the art at the time of the invention to modify the method of Trikkonen and Onggosanusi as taught by Kim, since Kim stated that the speed of optimal value convergence is increased.

Regarding claim 16, Trikkonen and Onggosanusi do not explicitly teach that the spatial processor is operative to spatially process the pilot and data symbols for each subband with at least two steering vectors selected for the subband.

However, the above-mentioned claimed limitation is well known in the art, as evidenced by Kim. In particular, Kim teaches that the pilot and data symbols for each subband is spatially processed with at least two steering vectors selected for the subband (see column 2, lines 34+, beamforming algorithm is chosen based on whether the data is a pilot data symbol or a non pilot data symbol, thus a different steering vector is obtained on a pilot data symbol than a data symbol).

In view of the above, having the method of Trikkonen and Onggosanusi, then given the well-established teaching of Kim, it would have been obvious to a person having ordinary skill in the art at the time of the invention to modify the method of Trikkonen and Onggosanusi as taught by Kim, since Kim stated the speed of optimal value convergence is increased.

Regarding claim 21, Trikkonen and Onggosanusi do not explicitly teach that the pilot and data symbols for each subband is spatially processed with at least two steering vectors selected for the subband.

However, the above-mentioned claimed limitation is well known in the art, as evidenced by Kim. In particular, Kim teaches that the pilot and data symbols for each subband is spatially processed with at least two steering vectors selected for the subband (see column 2, lines 34+, beamforming algorithm is chosen based on whether the data is a pilot data symbol or a non pilot data symbol, thus a different steering vector is obtained on a pilot data symbol than a data symbol).

In view of the above, having the method of Trikkonen and Onggosanusi, then given the well-established teaching of Kim, it would have been obvious to a person having ordinary skill in the art at the time of the invention to modify the method of Trikkonen and Onggosanusi as taught by Kim, since Kim stated the speed of optimal value convergence is increased.

6. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Trikkonen in view of Onggosanusi as applied to claim 1 above, and further in view of Ketchum (previously cited US 2003/0108117).

Regarding claim 7, Trikkonen and Onggosanusi does not explicitly teach that the at least one steering vector used for spatial processing for each subband is known only to the transmitting entity and the receiving entity.

However, the above-mentioned claimed limitation is well known in the art, as evidenced by Ketchum. In particular, Ketchum teaches that the at least one steering vector used for spatial processing for each subband is known only to the transmitting entity and the receiving entity (see paragraph 12, the steering vector known to the transmitting station is sent to the receiving station, therefore the transmitting station and the receiving station both know the steering vectors).

In view of the above, having the method of Trikkonen and Onggosanusi, then given the well-established teaching of Ketchum, it would have been obvious to a person having ordinary skill in the art at the time of the invention to modify the method of Trikkonen and Onggosanusi as taught by Ketchum, since Ketchum stated in paragraph 10 that high throughput can be achieved without individually coding each frequency bin.

7. Claims 17 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Trikkonen in view of Onggosanusi and Kim as applied to claims 17 and 22 above, and further in view of Ketchum (previously cited US 2003/0108117).

Regarding claim 17, Trikkonen, Onggosanusi and Kim does not explicitly teach that the at least two steering vectors for each subband are known only to a transmitting entity and a receiving entity for the PDU.

However, the above-mentioned claimed limitation is well known in the art, as evidenced by Ketchum. In particular, Ketchum teaches that the at least two steering vectors for each subband are known only to a transmitting entity and a receiving entity for the PDU (see

paragraph 12, the steering vector known to the transmitting station is sent to the receiving station, therefore the transmitting station and the receiving station both know the steering vectors).

In view of the above, having the apparatus of Trikkonen, Onggosanusi and Kim, then given the well-established teaching of Ketchum, it would have been obvious to a person having ordinary skill in the art at the time of the invention to modify the apparatus of Trikkonen, Onggosanusi and Kim as taught by Ketchum, since Ketchum stated in paragraph 10 that high throughput can be achieved without individually coding each frequency bin.

Regarding claim 22, Trikkonen, Onggosanusi and Kim does not explicitly teach that the at least two steering vectors for each subband are known only to a transmitting entity and a receiving entity for the PDU.

However, the above-mentioned claimed limitation is well known in the art, as evidenced by Ketchum. In particular, Ketchum teaches that the at least two steering vectors for each subband are known only to a transmitting entity and a receiving entity for the PDU (see paragraph 12, the steering vector known to the transmitting station is sent to the receiving station, therefore the transmitting station and the receiving station both know the steering vectors).

In view of the above, having the apparatus of Trikkonen, Onggosanusi and Kim, then given the well-established teaching of Ketchum, it would have been obvious to a person having ordinary skill in the art at the time of the invention to modify the apparatus of Trikkonen,

Onggosanusi and Kim as taught by Ketchum, since Ketchum stated in paragraph 10 that high throughput can be achieved without individually coding each frequency bin.

8. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Trikkonen in view of Onggosanusi as applied to claim 2 above, and further in view of Honig (previously cited US 6,956,897).

Regarding claim 4, Trikkonen and Onggosanusi do not explicitly teach that the one steering vector used for spatial processing for each subband is unknown to the receiving entity.

However, the above-mentioned claimed limitation is well known in the art, as evidenced by Honig. In particular, Honig teaches that the one steering vector used for spatial processing for each subband is unknown to the receiving entity (see column 3, lines 43+, the receiver generates an “estimated” steering vector, as opposed to the given steering vector being the steering vector known to the receiver).

In view of the above, having the method of Trikkonen and Onggosanusi, then given the well-established teaching of Honig, it would have been obvious to a person having ordinary skill in the art at the time of the invention to modify the method of Trikkonen and Onggosanusi as taught by Honig, since Honig stated in column 1, lines 66+ that faster tracking and convergence with less training samples can be achieved.

9. Claims 6, 10 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Trikkonen in view of Onggosanusi as applied to claim 1, and further in view of Walton et al. (previously cited US 2003/0235147, published 25 December 2003).

Regarding claim 6, Trikkonen and Onggosanusi do not explicitly teach that one pilot or data symbol is sent on each subband in each symbol period, and wherein the pilot and data symbols for each subband is spatially processed with a different steering vector for each symbol period.

However, the above-mentioned claimed limitation is well known in the art, as evidenced by Walton. In particular, Walton teaches that one pilot or data symbol is sent on each subband in each symbol period (see paragraph 110, each multiplier multiplies each symbol in its vector with its Walsh function to transmit two symbols per two consecutive symbol periods, thus averaging to one symbol per symbol period) and wherein the pilot and data symbols for each subband is spatially processed with a different steering vector for each symbol period (see paragraph 95, for each vector, the symbols are transmitted in different symbol periods on different antennas).

In view of the above, having the method of Trikkonen and Onggosanusi, then given the well-established teaching of Walton, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to modify the method of Trikkonen and Onggosanusi as taught by Walton, since Walton stated that transmission diversity can be achieved with criteria such as channel conditions and receiver capabilities.

Regarding claim 10, Trikkonen and Onggosanusi do not explicitly teach selecting the at least one steering vector for each subband from among a set of L steering vectors, where L is an integer greater than one.

However, the above-mentioned claimed limitation is well known in the art, as evidenced by Walton. In particular, Walton teaches selecting the at least one steering vector for each subband from among a set of L steering vectors, where L is an integer greater than one (see paragraph 95, two vectors are generated).

In view of the above, having the method of Trikkonen and Onggosanusi, then given the well-established teaching of Walton, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to modify the method of Trikkonen and Onggosanusi as taught by Walton, since Walton stated that transmission diversity can be achieved with criteria such as channel conditions and receiver capabilities.

Regarding claim 12, Trikkonen and Onggosanusi do not explicitly teach selecting a steering vector for each subband in each symbol period from among a set of L steering vectors, where L is an integer greater than one.

However, the above-mentioned claimed limitation is well known in the art, as evidenced by Walton. In particular, Walton teaches selecting a steering vector for each subband in each symbol period from among a set of L steering vectors, where L is an integer greater than one (see paragraphs 95 and 110, multiple steering vectors, where each steering vector belongs to a subband and a symbol period).

In view of the above, having the method of Trikkonen and Onggosanusi, then given the well-established teaching of Walton, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to modify the method of Trikkonen and Onggosanusi as taught by Walton, since Walton stated that transmission diversity can be achieved with criteria such as channel conditions and receiver capabilities.

10. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Trikkonen in view of Onggosanusi as applied to claim 1, and further in view of Jasper et al. (previously cited US 6,441,786).

Regarding claim 8, Trikkonen and Onggosanusi do not explicitly teach that the spatial processing with the at least one steering vector for each subband is performed only on data symbols.

However, the above-mentioned claimed limitation is well known in the art, as evidenced by Jasper. In particular, Jasper teaches that the spatial processing with the at least one steering vector for each subband is performed only on data symbols (see column 9, lines 65+, steering vector is calculated for each data symbol).

In view of the above, having the method of Trikkonen and Onggosanusi, then given the well-established teaching of Jasper, it would have been obvious to a person having ordinary skill in the art at the time of the invention to modify the method of Trikkonen and Onggosanusi as taught by Jasper, since Jasper stated that the effects of interference and noise can be limited.

11. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Trikkonen in view of Onggosanusi as applied to claim 1, and further in view of Shattil (previously cited US 2004/0086027).

Regarding claim 9, Trikkonen and Onggosanusi do not explicitly teach encoding the PDU in accordance with a coding scheme to obtain coded data, interleaving the coded data to obtain interleaved data, and symbol mapping the interleaved data in accordance with a modulation scheme to obtain the block of data symbols.

However, the above-mentioned claimed limitation is well known in the art, as evidenced by Shattil. In particular, Shattil teaches encoding the PDU in accordance with a coding scheme to obtain coded data, interleaving the coded data to obtain interleaved data, and symbol mapping the interleaved data in accordance with a modulation scheme to obtain the block of data symbols (see paragraph 88, data is encoded, then the coded data is interleaved by an interleaver, then the interleaved data is mapped into data symbols in a block).

In view of the above, having the method of Trikkonen and Onggosanusi, then given the well-established teaching of Shattil, it would have been obvious to a person having ordinary skill in the art at the time of the invention to modify the method of Trikkonen and Onggosanusi as taught by Shattil, since Shattil stated in paragraph 32 that greater bandwidth efficiency can be achieved.

12. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Trikkonen in view of Onggosanusi and Walton as applied to claim 10, and further in view of Hudson et al. (previously cited US 6,477,161).

Regarding claim 11, Trikkonen, Onggosanusi and Walton do not explicitly teach that the L steering vectors are such that any pair of steering vectors among the L steering vectors has low correlation.

However, the above-mentioned claimed limitation is well known in the art, as evidenced by Hudson. In particular, Hudson teaches that the L steering vectors are such that any pair of steering vectors among the L steering vectors have low correlation (see column 6, lines 3-12, correlation between vectors is either nonexistent (orthogonal) or very small).

In view of the above, having the method of Trikkonen, Onggosanusi and Walton, then given the well-established teaching of Hudson, it would have been obvious to a person having ordinary skill in the art at the time of the invention to modify the method of Trikkonen, Onggosanusi and Walton as taught by Hudson, since Hudson stated that symbol detection can be improved.

13. Claims 13, 18, and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Trikkonen in view of Onggosanusi as applied to claims 1, 13, 18, and 20, and further in view of Lewis (previously cited US 2004/0102157).

Regarding claim 13, Trikkonen and Onggosanusi do not explicitly teach that each steering vector includes T elements having same magnitude but different phases, where T is the number of transmit antennas at the transmitting entity and is an integer greater than one.

However, the above-mentioned claimed limitation is well known in the art, as evidenced by Lewis. In particular, Lewis teaches that each steering vector includes T elements having same magnitude but different phases, where T is the number of transmit antennas at the transmitting entity and is an integer greater than one (see paragraph 4, lines 11+, plurality of antennas are weighted and given phase differences for each steering vector).

In view of the above, having the method of Trikkonen and Onggosanusi, then given the well-established teaching of Lewis, it would have been obvious to a person having ordinary skill in the art at the time of the invention to modify the method of Trikkonen and Onggosanusi as taught by Lewis, since Lewis stated in paragraph 6 that location based services can be provided.

Regarding claim 18, Trikkonen and Onggosanusi do not explicitly teach that each steering vector includes T elements having same magnitude but different phases, where T is the number of antennas used to transmit the PDU and is an integer greater than one.

However, the above-mentioned claimed limitation is well known in the art, as evidenced by Lewis. In particular, Lewis teaches that each steering vector includes T elements having same magnitude but different phases, where T is the number of antennas used to transmit the PDU and is an integer greater than one (see paragraph 4, lines 11+, plurality of antennas are weighted and given phase differences for each steering vector).

In view of the above, having the apparatus of Trikkonen and Onggosanusi, then given the well-established teaching of Lewis, it would have been obvious to a person having ordinary skill in the art at the time of the invention to modify the apparatus of Trikkonen and Onggosanusi as taught by Lewis, since Lewis stated in paragraph 6 that location based services can be provided.

Regarding claim 23, Trikkonen and Onggosanusi do not explicitly teach that each steering vector includes T elements having same magnitude but different phases, where T is the number of antennas used to transmit the PDU and is an integer greater than one.

However, the above-mentioned claimed limitation is well known in the art, as evidenced by Lewis. In particular, Lewis teaches that each steering vector includes T elements having same magnitude but different phases, where T is the number of antennas used to transmit the PDU and is an integer greater than one (see paragraph 4, lines 11+, plurality of antennas are weighted and given phase differences for each steering vector).

In view of the above, having the apparatus of Trikkonen and Onggosanusi, then given the well-established teaching of Lewis, it would have been obvious to a person having ordinary skill in the art at the time of the invention to modify the apparatus of Trikkonen and Onggosanusi as taught by Lewis, since Lewis stated in paragraph 6 that location based services can be provided.

Conclusion

14. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

15. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Curtis A. Alia whose telephone number is (571) 270-3116. The examiner can normally be reached on Monday through Friday, 9am-6pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Aung S. Moe can be reached on (571) 272-7314. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Curtis A Alia/
Examiner, Art Unit 2474
2/23/2010

CAA

/Steven HD Nguyen/
Primary Examiner, Art Unit 2473